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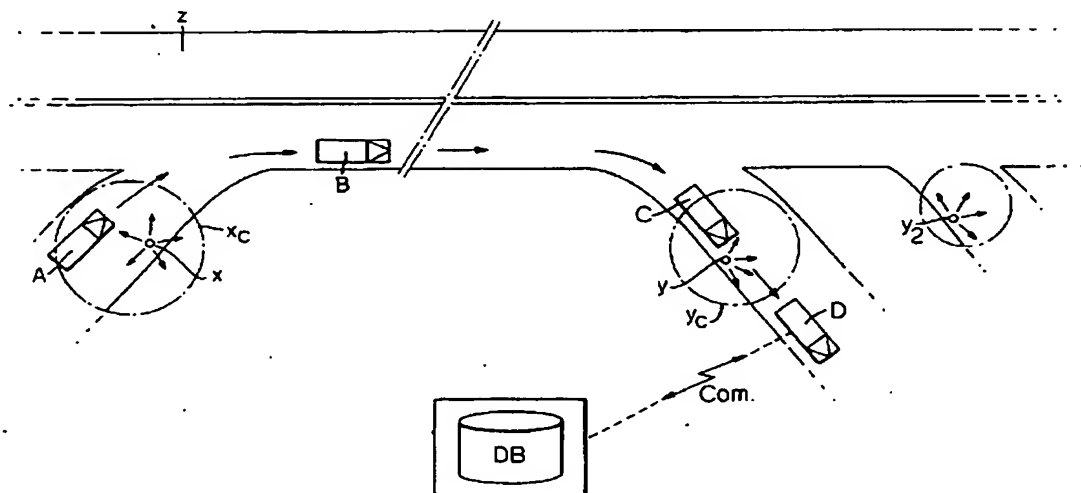
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **SYSTEM FOR HANDLING OF TOLLING COLLECTION AND FEES RELATED TO ROAD AND PARKING FACILITIES**



(57) Abstract: A method for automated handling of toll fees and parking fees, making use of signal towers at entry and exit points as well as communication terminals in vehicles that communicate with a central data base server.

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SYSTEM FOR HANDLING OF TOLLING COLLECTION AND FEES RELATED TO ROAD AND PARKING FACILITIES.

The invention involves system for automated payment of tolling and parking fees related to roads and parking facilities.

Tolling fees is increasingly being used as a mechanism to both;

- 5 - finance road projects and facilities as well as maintenance, and to
- regulate and tax the usage of cars/vehicles.

The equivalent is valid for parking facilities.

- 10 The development within IT/telecommunications has made it possible to use automated payment instead of manual payment methods; making the systems more user friendly as well as more secure to fraud and failures.

- 15 Examples of such automated systems is presented in US5310999 and US 5144553. Characteristic of the aforesaid systems is the establishment of a toll gate or toll plaza, involving the need for communication between the toll plaza and a central data base server, for transaction handling; which is costly and is a significant source of failures.

- 20 The invention is developed on the basis of a system involving:

- a) Each vehicle has installed a logging- and communication terminal (hereinafter "Terminal") which allows the receipt of data of certain format, logging of time for the receipt of the aforesaid data. The Terminal also has the ability to communicate to a central data base server.

- b) It is established specific radio signal transmitters (hereinafter "Signal-towers") by:

- Road facilities.
- Parking facilities.
- Other facilities or systems where automated tolling collection may be implemented.

The Signal-towers transmit data; which is received by Terminal.

- 35 c) It is established a central data base server (hereinafter "Server") whereas the transaction data is registered for clearing and invoicing of each vehicle.

- 40 The object and purpose of the invention is to further simplify and secure the transaction process, in order to make automated transactions handling, clearing and invoicing of road tolling fees and parking fees to be available cheaper and more secure than the available systems today allow.

The aforesaid object is achieved by a system which in addition is characterised by:

1. The Signal-tower which is located by the entry point of the road-facility or parking-facility, being subject of automated fee collection, transmit a wireless signal which is received by the passing vehicles. The signal contains information on the actual location of the entry point.
2. The Signal-tower which is located by the exit point of of the road-facility or parking-facility, being subject of automated fee collection, transmit a wireless signal which is received by the passing vehicles. The signal contains information on the actual location of the exit point.
3. When a vehicle is passing the entry point, the Terminal receives signals from the Signal-tower for entry to the road- or parking-facility. The signal is logged as entry-data with specific location reference in the Terminal together with the actual time of entry, with no mandatory need of communication between the Server and Terminal.
4. When a vehicle is passing the exit point, the Terminal receives signals from the Signal-tower for exit to the road- or parking-facility, which together with the logged data of entry initiates a communication sequence from the Terminal to the Server. The Terminal transmits data containing the logged data as well as a unique identification of the actual Terminal: Entry data, exit data, hereunder time of entry and exit or the time difference, and data for identification of the actual Terminal.
5. The Server performs clearing and invoicing of each vehicle based on the received data.

A drawing of the system is given in Fig 1.:

On a motorway (z) a Signal-tower is located by the entry (x) and by the exit (y). The Signal-towers transmit data covering only the area where the vehicle is passing; giving a local covering cell (accordingly x_c for x and y_c for y) making it possible for traffic on the road and other places not to be touched by the signal. Central placed Server is indicated at the bottom of the drawing with the letters "DB" (for Data Base). Communication between Server and Terminal is indicated with two-way arrows and the letters "com".

The drawing shows a vehicle with Terminal in different positions:

In position A the vehicle enters into the motorway and is passing the Signal-tower x. The Terminal in the vehicle receives then the signal transmitted from the Signal-tower on entry to the motorway, the signal is logged in the Terminal. No communication between Terminal and Server needs to take place at this moment. The vehicle in position B has logged entry signal in the Terminal.

In position C the vehicle is passing through the covering cell y_c by exit of the motorway, and the Terminal receives then a exit signal from Signal-tower y. Thereafter, in the vehicle position D, the Terminal will initialise a communication sequence to the Server, and the signals received from x and y together with the more specific time-reference is transmitted to the Server. The Server can thereafter process the data for clearing and invoicing. Each entry- and exit-point are uniquely defined and transmit a unique signal. It is indicated in Fig. 1 with the indication of another exit-point y_2 located to the right of y. The purpose of this is that the signal from each entry-point together with the signal from the exit-point shall give sufficient basis for the calculation of distance based fees.

At some facilities payment is made on the basis of one single passing rather than as a result of driven distance or time used. In such cases the same principles as described above may be used, with the modification that x and y forms one single signal-tower which sends one or more signals that by it self initiate the communication sequence similar to the situation of the vehicle in position D.

In parking facilities the same system as described above is being used: Position x is the entry to the parking facility, position y is the exit of the parking-facility. The Server will in such case use the time difference from entry to exit, rather than the distance driven, as basis for the fee calculation and invoicing.

CLAIMS:

1. System for handling of tolling collection and fees related to road- and parking facilities which involves:

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- a) The road – and/or parking-facility is equipped with a Signal-tower by the exits and entries of the facility, which transmit signal to vehicles that entries or exits the facility.
- b) The vehicles is equipped with a Terminal which receives signals from the Signal-towers, is logging data received and may communicate with a central Server.
- c) The central Server is processing data received from the Terminal, and process the basis for invoicing of each vehicle.

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and is **characterised** by:

- d) The Signal-tower by the entry-point transmit signal on the location of the entry point, the time of the data transmit and data on the Signal-tower being located by an entry point.
- e) The Signal-tower by the exit-point transmit signal on the location of the entry point, the time of the data transmit and data on the Signal-tower being located by an entry point.
- f) When a vehicle is passing a entry-point, signal from the Signal-tower by the entry-point is received and is being logged in the Terminal. The signal does not necessarily initiate any need for communication between the Terminal and the central Server.
- g) When a vehicle is passing the exit-point the signal from the Signal-tower by the exit-point is received, which together with the logged signal from the entry-point initiates a communication sequence from the Terminal to the central Server.
- h) The central Server receives the signals and data from the Terminal, the data is processed for the establishment of a basis for invoicing purposes.

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2. System in accordance with claim 1 which is **characterised** by that the telecommunication from the Terminal to the Server, partly or in whole take place by use of GSM, GSM SMS (Short Message Service), GSM Data, UMTS, GRPS, DECT, PCS, wireless ISDN or other wireless or wired communication system or –protocol.

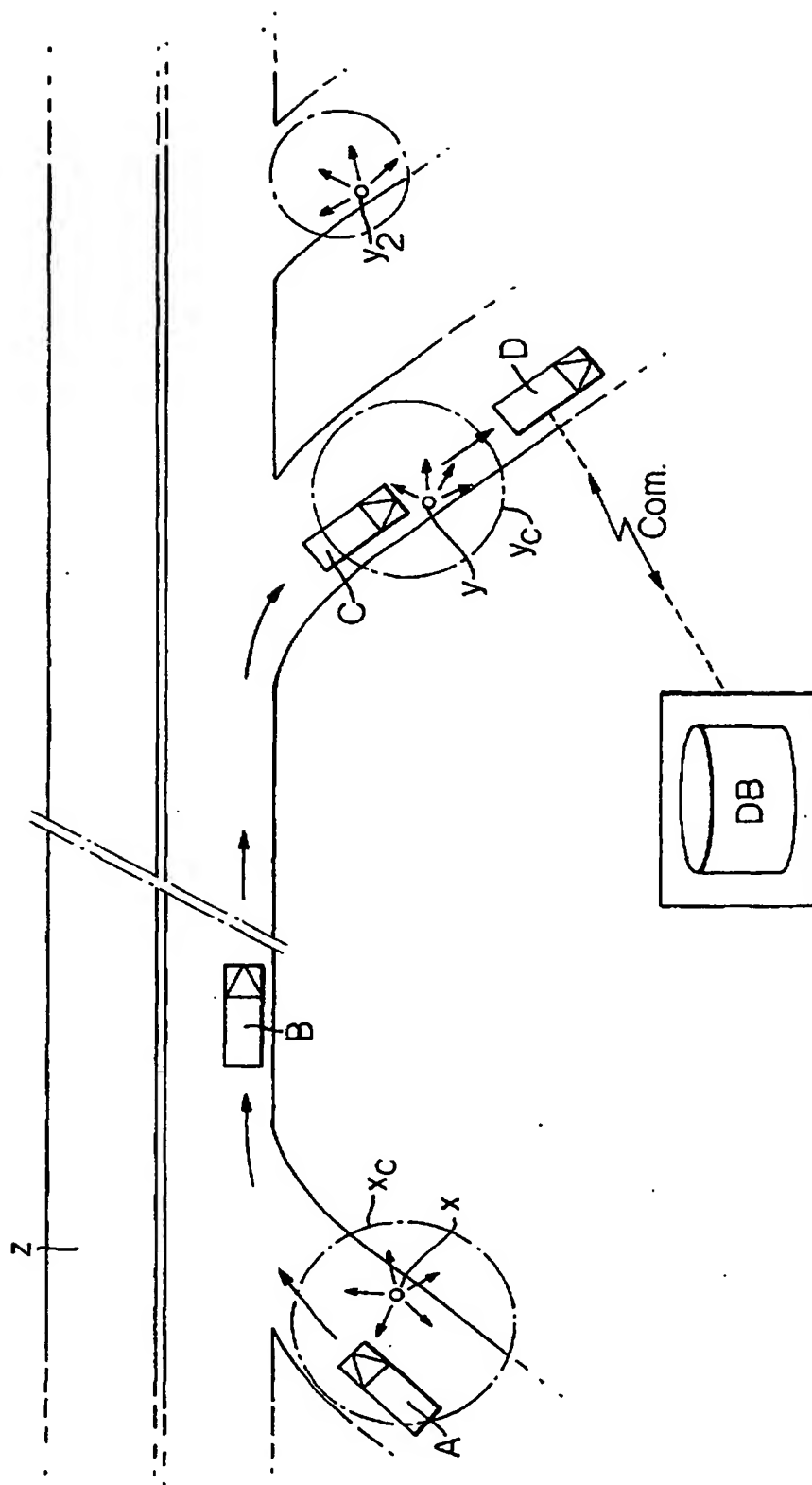
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3. System in accordance with claim 1-2 which is **characterised** by that the communication and/or transactions between the vehicle and Terminal with the central Server, may happen partly or in whole, direct or indirectly by the use of internet or other databased telecommunication network or –protocol.

4. System in accordance with claim 1-3 which is **characterised** by that signals from Signal-towers partly or in whole may be initiated by initiating signals from the Terminal.
- 5 5. System in accordance with claim 1-4 which is **characterised** by that each Terminal may have unique identification as well as possibility of observing the actual previous registrations and data of the Terminal in the Server, as well as it may have possibility of planning driving routes and driving pattern; with or without the use of internet-based maps or other tools.
- 10 6. System in accordance with claim 1-5 which is **characterised** by that the Terminals functions are covered by two or more functional units.
- 15 7. System in accordance with claim 1-6 which is **characterised** by that the central Server's functions are covered by two or more functional units.

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Fig.1.



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INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G07B 15/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F, G07B, G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5663548 A (HIRONAO HAYASHI ET AL), 2 Sept 1997 (02.09.97), figures 1,2, abstract --	1-7
A	US 6019285 A (NORIHIRO ISOBE ET AL), 1 February 2000 (01.02.00), figure 1, abstract --	1-7
A	US 5751973 A (JOHN J. HASSETT), 12 May 1998 (12.05.98), figure 1, abstract -- -----	1-7

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/07/01

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